Laboratory Notebook, Cat. 1171

This notebook was begun in 1873 and contains only one dated entry, for April, 1874. Most of the notes and drawings are by Edison. There are also a few entries by Charles Batchelor, including notations of hours spent on experiments. The material relates primarily to diplex, automatic, and chemical telegraphy. The front cover has been labeled by Batchelor: "Experimental Researches Vol. 1 Edison's Laboratory." The book contains 148 numbered pages.

Blank pages not filmed: 108-117, 120-148.

Missing pages: 1-24.

F-1675 Cat (1)
1878-1879
ex 4/10 pus

Experimental Research

Vol. 1

Edison's Laboratory

E1675
cat. 1171

Try experiment on the delicacy of a frogs leg. it is stated by Pepper that a frogs leg is 36 000 times more sensative than an Electroscope (Condensing) this frogs leg may be arranged to work a second circuit by attaching a circuit breaker to it. It is possible that a live frog may be used, in this case the instrument would be of a permanent character.

Shepnark

Try if the freed oxygen from a chemical recording pen can be attracted away from the pen and a decomposition partially prevented, by a powerful local magnet with pointed poles the object being to attract the oxygen away from the iron pen after the current ceases to prevent an elongation of the mark upon the chemical paper. Thus.

It is stated by Pepper that Oxygen is magnetic.

Mix a solution of Pyrogallic acid with potash and make some chem paper. p & iron pen. Pepper says freed oxygen gives a dark brown color.

Try chem paper in solution of Sulphate of manganese.

Schonbeins test for ozone is 1 part Iod Pot in 200 parts distilled water. 10 parts starch thickened by heating. brushed on bibulous paper. Try effect of decomposing with pens.

Pepper says ozone is present in the oxygen tube of a Voltometer. which shows that both are set free

Ozone bleaches Black Sulphide of lead or plumbic sulphide, oxydization takes place, and white sulphide of lead formed. This may give good high solution.

Powdered Antimony becomes very hot and combines when placed with iodine.

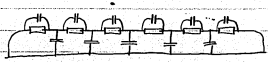
Palladium absorbs great quantity of hydrogen Graham used two coils like a watch spring immersed in water (acidu prob) and connected the two ends to a small battery, decomp of water took place the free hydrogen being absorbed by one of the spirals of palladium which quickly expanded when the current was reversed the first coil contracted and the other expanded It may be that with a proper coil arranged with a lever that the smallest current could be made to work the lever and close a secondary circuit or with mirror throw a light upon a screen.

Test schober paper - also Boston.

Procure samples for chemical decomp of paper.

Ascertain the difference if any upon artificial cable between 20 cells high R and 20 cells very low R.

Ascertain if with an artificial cable of a capacity of 1000 miles the condensers and resistances of another 1000, can be arranged as below to entirely destroy the static charge.



find at what degree of dryness iodized and sulphuron paper is the most sensative.

1893

Ascertain the highest practical speed attainable with a short relay operated by perforated paper upon 300 mile line have. Static capacity of regular with proper amount of leakage to allow the discharge of relay to have its proper evil effect. The record is given upon Iodized paper. The relay repeating into local circuit. Try speed with the relay armature at different distances away also shunted with condenser. magnet etc diversify. Then at best speed substitute Morse Register and large local and obtain highest speed. The polarize Relay in one direction with large permanent magnet and see if speed is increased or decreased. Then on same circuit substitute 200 ohms Relay R for 100. Then 50 ohms and see if decreased induction is of greater consequence than decreased strength. Then substitute a regular polarized relay with shunt on trans and extra bat or N 25 P 50 paper cutting out P and obtain highest speed here.

Chas Batchelor

The matter in Butternut Shucks give a color with Sulphate of iron, get Butternuts

Chloroform is a test for iodine.

Experiment with the instantaneous formation of metallic tin flakes by Chem Decomp in glass & on paper to form metallic dots & dashes in paper for repeating.

Experiment on the speed, strength of Current and form of coil which is best to work by induction it may be a primary of 20 000 ohms R and a secondary of 1000 ohms will work with very delicate current.

Ascertain if a given battery will just give a perceptable mark through a large resistance, if by using a primary of high resistance and good second if this mark can be augmented.

Try telegraphing from NY to NY via Albany by work armatures only.

Try Littles Solution more carefully. Formula. 12 H_2O 4 ph Sat Sol Chl Calcium 2. Sat Sol Pru Pot. add Chromic acid till it gives a sherry color then add $\frac{1}{50}$ part. Chl Sodium.

Look at English Pat 2429. see if unison worm anticipated

Get date contract with T & J. and make list Patents out for Edison.

Duplex experiment - Sending two messages in the same direction over the same wire.
The principle is sending reversed currents recorded on a polarized relay for one message and increasing and decreasing the strength of the current to effect another relay. The evils to contend against is to prevent bad effects upon the relay worked by increase and decrease at the moment of reversal, in sending P & N Currents through an ordinary magnet or Morse Relay. the cores must entirely lose their magnetism ~~of~~ due from an N current before they can acquire an opposite polarity due to the P current, at the moment of the polar change there the magnet exerts no force upon the armature hence the spiral spring will draw the armature away from the face of the magnet for an instant, and when the reversals are very rapid the armature lever scarcely comes in contact with the front contact point. To get over the effect of this upon the local circuit containing the sounder, which in this case would

vibrate at each reversal and work the sounder. I reverse the ~~useful~~ usual method of connecting the local circuit and make connection with the back point, so than when the lever of the relay is away from the magnet, the local circuit is closed. This closes a repeating sounder, (ie) a sounder whose lever breaks and closes another local circuit on. When this sounder is closed it opens the second local circuit. So the same effect is brought about as if the relay lever operated the local circuit and sounder in the ordinary way. The reason this secondary plan is used is because when the current upon the main line is supposed to be of full strength and the relay closed the reversals constantly tend to vibrate the lever as the lever flies away from the front contact point but the cores of the relay become re-magnetized and reattract the lever before it touches the back point at a slow speed consequently the repeating sounder is unaffected and of course the receiving sounder. But if the reversals are sent very rapid the lever of the relay makes a slight contact with the back point this would close the secondary sounder were it not that that sounder being a non-receiving instrument may be adjusted very high consequently the slight contact which the relay lever makes with the back point on the act of vibrating is insufficient to allow the repeater magnet ~~of~~ to reach it maximum strength which is necessary to overcome the tension of its spring.

If I find in actual Trial this.

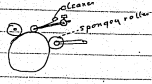
R varied from 800° to 9000°. ~~That the~~ relay. (Phelps 126 ohm) ~~with~~ Gallery reversed by Double springs operated by sounders. Number of cells increased or decreased by a second sounder and contact spring polarized relay 75 ohms. 8 cups always on for working polarised relay increased by adding 16 for working sounder by 16. That on 800 ohms Perfect

signals were received and relay had great amount of margin increased to 1000. signals perfect. margin on adjustment of relay increased. increased to 2 3 5 7 & 9000 ohm margin on relay increased with increased resistance. decreased extra battery to 8 cups results same decreased battery 8. regular from 8 to 4 cups signals just as perfect. inserted in line two 200 ohm relays. signals on high resistance 3000 & 4000 ohms perfect, but on low resistance 500 ohms inductive discharge prolonged the opening at the moment of reversal when inverted current are sent through ordinary electro-magnets the inductive discharge are much more powerful than when a current of one polarity is intermitted hence the inductive effect of the coils of the receiving magnet themselves are seriously effect the adjustment on short circuits, because the current which passes through them is stronger + the Route for the discharge short. by reason of the low resistance of the circuit, One curious thing observed in this experiment is that with a permanent reversable current sufficient to work the polarized relay. that the ordinary relay may be adjusted to give good signals by the addition of but 3 cups to the permanent battery on a R of 8000 ohms the battery may be increased from 8 cups to 40 without effecting the adjustment of the polarized relay.

Trial in New York unsuccessful on account of probably Relays in line, insufficient battery. Battery on line direct by cross or leakage. & difference in R of Relays. used & poor facilities

make 4 rolls of different strength Sulphit Pot paper.

Have Acid Trans fixed thus

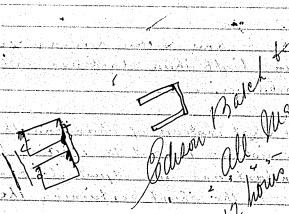


iron roller per which must be cleaned as it revolves and newly moist Sulpt Kale paper with Extra sponge roller to dry in passing through machine - Impossible to keep Roller Clean -

A Sulphate or any battery having zinc is more constant in light than darkness, vide zinc in Chem Solubilities,

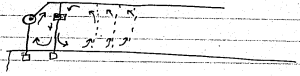
It may be that instead of changing the amount of magnetic resistance to cut the working that it may remain constant and an adjustable Rheostat placed in that side of the shunt containing the receiving paper. — no good with a paper having a resistance of several hundred miles I can conceive how the shortening of the resistance of the magnetic shunt can bring any perceptable quantity of current from the line Considering the immense resistance of the paper Therfore I think that decreasing the length of the magnetic shunt does not furnish much more if any counter discharge but only weakens the Effects of the static so that it is imperceptable on the paper. If this is the case it is better to use one high resistance magnet only in the shunt and regulate the weakening of the static by an ordinary rheostat in the shunt containing the instrument, This will make the resistance at the receiving station much greater than in the old plan hence less discharge will run out or be attracted to that end The bulk going to earth at the transmitting station,

It is possible that a very fine wire magnet

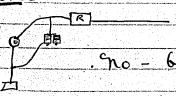

Cadeau
Back to Tom
All Insight
12 hours

having a resistance as high as 5000 ohms used as a shunt and and a Rheo in the other branch properly adjusted might be able to give a greater proportionate Counter charge than the ordinary method,

I think that in wet weather the efficacy of the shunt is much less than in dry weather, as the discharge from the magnets in dry weather have but one route practically through the paper while in wet weather there is an extra route for their discharge viz the derivations or leakages near the receiving end thus

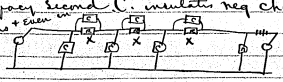


It would probably be a good idea to insert a plain rheo as shown below to increase R. of the extra route of the discharge, & thereby deflect it upon the paper & at the same time weaken the main & static charge so that the Counter discharge would bear a nearer proportion and be able to overcome — A noticeable Change for worse



No - bad effect

Try this experiment — the additional R. X. necessary to get efficacy second C. insulates neg charge, exactly as much as it adds + even in excess. so the failure

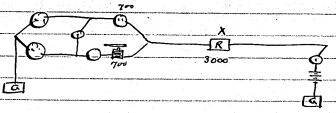


It may take double or thrible the number of

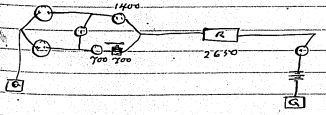
condensers to shunt the resistances as the other to kill the static charge, as a portion of their discharge is killed or short-circuited by the R themselves and do not go on the line

Tried Extra R brought in counterbalance Exactly the good Effects of the Extra Condensers In fact it did more harm than good

Test to ascertain if the discharge from a magnet is lengthened by an increase in the resistance of the circuit in which it discharges Thus



Increase the length of R of the discharging circuit but insert a galvanometer in main circuit so that the same strength of current is observed. The loss due to the increase of the inductive circuit is made up by decreasing the resistance of the R Rheostat X. The same strength of battery will pass through the relay but the R of the discharging circuit will be doubled. Thus

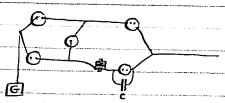


This arrangement should give a weaker but longer discharge if the discharging time depends upon the exterior R if not then the discharging time unlike a condenser is independant of the the r of the discharging circuit.

If the current is not weakened the tension must go very high.
Remark

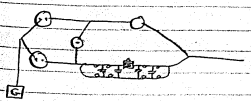
Try sheet lead for secondary batteries, also sheet iron and tin, etc

Try this



Clean & polished 26 hours

This



Kill the discharge

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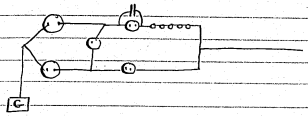
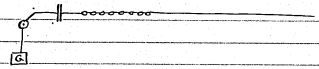
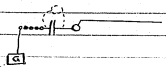
Try this to lengthen the discharge



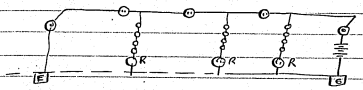
This



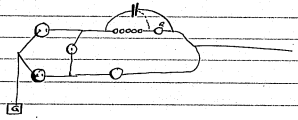


Try the amount of discharge from 6 bottles with water alone, and with various quantities salt, also ~~wat~~

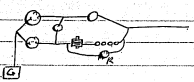
Try this and ascertain if the action is not like a cable



Try this.



This - The placing of the secondary battery in the direct circuit branch instead of the shunt alters its action as regards the relay but not the line, hence by placing it in this way, the sticking of the relay may be prevented thus



Remark. both ways work. the cause of sticking is that on the opening of main circuit the secondary sends a longer charge than the relay and the excess goes out on line opposed to the static chge but a portion circulates within

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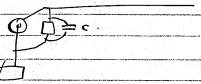
The shunt and this excess makes the relay stick. This is good thing for line but bad for relays. But as the R of the secondary can be increased, it will not perceptably interfere with the relay. The remedy is to get the secondary pile to send shorts after currents. 7 cells kill the inductive discharge of the heaviest relay I have. 1400 ohms. The R of 7 cells well sealed is about 600 ohms with only water 5000 ohms. First way made relay stick worse than a plain shunt as the 5 battery current was added to discharge. but placing it in last diagram it works against & you can't stick relay but acts same with Relay 1400 ohms dash comes thus - shunt near sending End. none R end.

Twas the jar of circuit closing lever - made secondary Contact

In my reversal duplex. the effects of the discharge current from the ordinary & polarized magnet interfere with the ordinary relay making it vibrate while the polarized is rendered sluggish. But if the secondaries are applied as shown and not too strong & the shunt is considerable it entirely destroys the effect of the secondary discharge from relay - and a greater margin is obtained on the ordinary relay while the polarized Relay follows the reversal key promptly - ~~When~~ When a positive current has been on line for any length of time say for a dash the secondary battery becomes highly charged & when the current is reversed this charge acts with it hence this wave will be stronger than the other and it is this that interferes with the ordinary Relay to a some extent as this relay depends on changes in strength of current = still I think the secondary will benefit greatly this

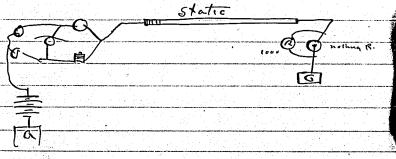
form of Duplex

Try this



Passing Oxygen down one side of a platina Electrode and hydrogen (common gas) down the side of the other platina Electrode immersed in Water Acidulated with Sulphuric Acid and also again with Chloride Sodium gave no Current perceptible upon a 6 ohm Sounder of a delicate 126 ohm Relay

Try experiments with Battery at sending — mistake at receiving End only Ohms



Try a line statically fixed as one side of the bridge to study its nature.

Edison — Batchelor 16 ohms

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Test the induction

Chemical Solution:

To a gill of water add tea spoonfull Nitrate Ammonia. To this add what is held on small Knife blade of aurichloride of Sodium, The paper is white, The marks with iron pen are blue, but with a fein pen yellow at first but soon become purple. (purple of Cassius). The sensitiveness is increased by adding a slight amount (less than of of aurichloride of Sodium) Bichloride. Then there appears after a few hours a Continuous mark running through the dots and dashes. — KCl Sodium does not appear to act as well as Nitrate Ammonia

Find out if it is the addition of the Corrosive Sublimate (Bi-chl) that cause the continuous line to appear

When Ferrocyanide solution, with Nitrate Ammonia as given in Culleys book is used the iron pen is polarized and even on very short circuit the dash commences thus

When Sulphuret of Potash is used the polarization of the pen is greatly augmented

Make 3 Large Secondaries with Calland jars & pure water to get a shorter after Charge.

Edison & Batchelor 12 hours

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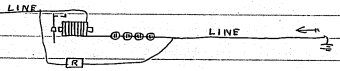
Roughen the surface of the electrodes of secondary battery to allow of escape of gases more quickly so as to give a shorter after charge.

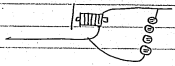
Test with line composed of 6 relays alone. Then place secondaries to each and see what induction of any increase and decrease the number of secondaries to ascertain what is the smallest number that can be used.

I find that the secondaries should be arranged with the relays thus and not as a shunt



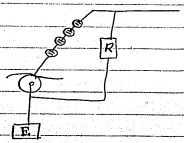
The magnet tends to send a current after the battery is taken off to the left. The secondary battery to the right. The two sources of power keep all portion of the derivation circuit at the same potential hence no current is generated. if too many cups S are used the current from them is greater than that from the discharge of the magnet, ~~then~~ this would close the relay again but if the number of cups are reduced the balance can be obtained. or the resistance of the shunt may be made greater and the balance obtained in that way.

In ~~receiving I~~ If the cups are arranged as a shunt thus.



It is obvious that as the magnet generates a current opposing the main current on closing and in the same direction on opening. and the secondary battery ~~sends~~ reverses this order. That by placing this in the shunt. The two electromotive forces within it are working together, although the inductive effect will not go out upon the line, the relay is made to work sluggish owing to the currents both from the magnet and secondary battery circulating in the derivation after the main battery has been disconnected.

In ~~the~~ receiving with a secondary battery is should be arranged with the receiving paper the same as with a relay Thus



In a trial with Baltimore Seven to Eight hundred words per minute were received with Relay at Phila. shunted. With no Earth shunt at Baltimore, The number of Cups first used were 15. but 200 words could be received. The number of Cups were increased to 35. with the above result. I presume that with 100 Cups almost any speed

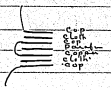
might be obtained with shunt and probably without shunt at sending station.

Secondaries well salted. have the Ends of the Electrodes barely touch the walls see if the gas does not escape more readily and give a shorter discharge — No. ~~less~~ increased R decreased discharge

Use two gutta percha wires stripped bare for 1/16 of an inch at ends immerse in bottle to bottom see if pressure does not force gas up

The with charge is doubtful - It may be that at the monement the current is closed. ~~to~~ but little gas is formed and there is no appposing current set up by the secondaries but as the gas increase an ~~new~~ apposing current is generated and this weakens the main current.

Make a secondary battery of discs of copper, cloth & paraffined paper thus



Attach the secondary batteries to the two relays in my Reversal Duplex So see if the distruction of the induction of the magnets does not make less opening of the armature

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of the Ordinary relay.
Yes vast difference - there is slight difficulty if the Secondary battery is allowed to be discharged if a long positive has been sent a negative. Current will flow from the battery when the main battery is taken off as it is not taken off but is followed by a negative this in addition to that of the secondary battery makes the negative wave stronger than the preceding positive & thereby interferes with the adjustment of the ordinary, but I think that if the Secondary is proportioned so as to neutralize the discharge from the magnets only no difficulty will be had from variation in strength of the Current).

Salt well all the secondaries on hand. Connect for intensity connect them to a fine relay. Then take 6 cups Carbon battery & charge 6 secondaries at time quickly one set after another. see if these intermittant charges are not Continuous on relay -

In charging the Carbon battery Current is thrown into Circuit through high R of S battery this kills effect this experiment but the relay shows Continuous Current less that due from cutting in

A Revolving Rheotomate might be arranged with several sets of Secondary batteries, and a charging battery so that one set could be charged for an instant thrown into Circuit and the previous ones

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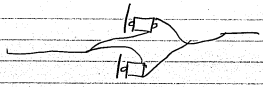
withdrawn & so on. Problem.
Does 100 Cups secondary Charged with 10 Cups primary have the tension of 100 Cups in discharging or only 10 Cups; = 3 cup alternate on 6 full. charges it strongly last 1 min - trouble is to keep ckt closed when changing from one charged battery to the other keep chg batty
Connect two relays. Thus & ascertain if the discharge of one neutralize the discharge of the other



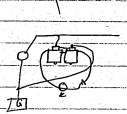
No. Each relay generates ½ as much induction as it would if all the current passed through it. the two send their charge upon the line in the same manner as any two electromotive forces of the same X. would if arranged in this manner

Duplex relay = work over line by induction current

arrange in first place with battery direct with 300 ohm shunt and small relay in, with best magnet shunt at receiving end, and increase R so that it is impossible to get 100 perfect words per minute, then replace shunt by double coil relay and work with induction current. SEE if 100 can be obtained with these induced Currents.

Wet 10 rolls Baston perm Reg for seconds.

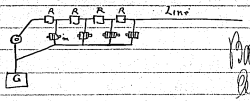
arrange as above (previous inductive Ex) if induction don't work and replace shunt and use Duplex relay as receiving shunt. use one Coil only. Then arrange a box of battery with a Bradley Rheo. with second coil, & unplug till the main line current neutralizes the local current and leaves an excess, The Theory being that the reversal of the polarity of the iron cores generate more induction than without, second Ckt. Try both with & without second circuit Try without battery by closing coil thus



add Condenser thus ∅

Put Duplex relay in bridge, balance
The put a second battery to second coil.
to as to balance Effect of main Then see
if there is any induction if so if it is not
in the Contrary direction to what it would
be regular —

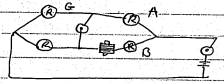
also.



Patented 12
Edison

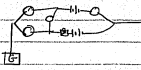
Tried it OK

Try this — Obtaining the inductive effect free from the main current and regulating the Cattle so it will just make the dashes.

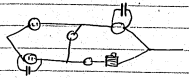


All sides being equal in Resistance no current from the battery passes through the chemical or other instrument in the bridge wire, but the inductive action on the opening and closing of the main is generated within the circuit formed by the two sides of and the bridge. The currents are recorded upon the paper. Any inductive arrangement acting like a magnet Condenser etc may be inserted in these branches and the inductive action observed free from the Currents which form it. The difference in resistance of the different apparatus which it is desired to observe is equated for by the Rheostat A.B. so that the same quantity of current is made to pass over the two branches in all Cases, and extra magnet inserted at G doubles the effect. If placed in the top branch if placed in the lower branch it neutralizes the effect of the other magnet. This device is very convenient to observe the polarization in liquids with metallic Electrodes.

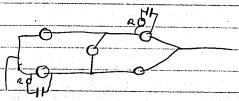
See if the inductive effect of the magnet is affected by the batteries balanced in the bridge thus



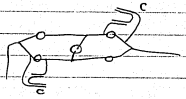
Try this



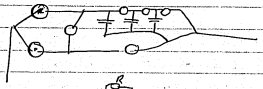
Try with magnet & without, see what condensers will do. Then this to get longer charge



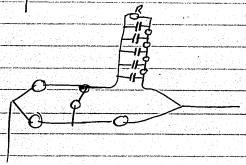
also



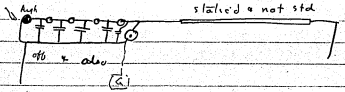
Try this



This



This



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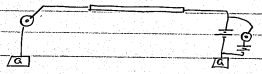
Try if working on well statied line is doubling quantity well form dots + dashes thus Be careful



The excessive amount of iodide of potassium used for the regular solution led me to believe that only a certain amount was necessary to give good mark and the balance only increased the conductivity but I find that by using a small quantity & adding Chl Sodium to give the requisite conductivity that it a failure & the excess of iodide lost is heavy very probably some other method might be used that would not reduce the Iodine & at same time give the paper proper conductivity.

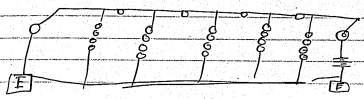
Try effects on Duplex relay in bridge by closing second Coil = Nothing Noticeable =

Try receiving on well statied line with Battery at receiving End ~~and arrange thus~~

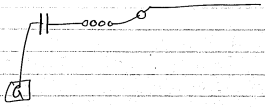
Try and see if a number of bottles with pure water only arranged along resembles after the manner of an artificial Cable does not imitate the Atlantic.

Thus

over



Try this to lengthen the discharge.



Get double pen holder made.

Get some Alcohol Eggs for albumen, Charcoal
Cobalt Sugar. Onions red beets Red
Cabbage Syrup Violets Petal Red Rose
Hollyhock flower Brazil wood.
Yerguma. Lump of manganese.
Sub Chloride Copper

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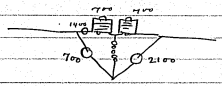
Try this on Stop current to see if it kill induction. Second to see if Relay doesn't stick



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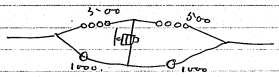

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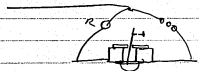
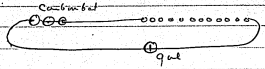


No good to-day
Varies according to time
Closed & again it works
but unpredictable for
about reason

See if any induction from this

Find out what that thump is that is felt by finger on receiving pen when paper only held Ckt broken.

Try this



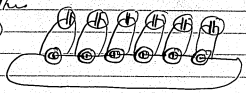
No good

Try ferrocyanide & perid & nitrat tin & after very dip in Sol Nitric & Pyrogale. avoid

Treat foil with Sol Gall. go for marks & make them immediate =

HUDSON

Try the



see which is strongest & with Secondam or without. The Secondam slowed so well salted = adds nothing cuts off. in direct weaks by opposing it with K. heat iron receiving pen with glass tube pointed with flexable rubber pipe to see if the protoxide is not more readily formed.

Chemical Solutions

Try Caustic Potash - Water - iron pen -
- No Mark -

Try Carb Pot. iron pen - water, - Salt

Try Carbonate Pot copper pen water Salt
Caustic " " " " "

Try Iodide Ammonia - water starch platina pen - Potash bleaches blue color formed by Combination of Iodine with starch.

Try Citric Acid water Iron pen - develope in Ferrocyanide & Ferricyanide, Try Salt.

Try - Dissolve Indigo in Sulphuric acid iron pen. perhaps Salt -

Try Carbolic A. Iron pen water - S

Try Arsenious A. Copper P Water . S

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arsenous acid almost insoluble in wate.
Readily S in B water & Hydro chle a

Try Cyanide P. & Peroxide Iron - Water
S. Iron P.

Try Sulphocyanide Ki H_2O & Chl. Cl.

Try Ferrous Cyanide, Silver. P. H_2O ChlCl

Try Bromide Kl. ChlCl. H_2O all the pens

Get some Hydroferrocyanic a.

Try Acetic a. Salt iron P. H_2O.

Try Meconic a Iron plume, then ChlCl.

Mem - Nitro Prusside Sodium Pharm p 1456
delicate test for alkaline Sulphuets,
such as Hydrosulpht ammonia &
Sulpht Ki

Test that have been made, recorded
slips in Scrap B. Tests of addition to
Regular Ferrid - H_2O ChlCl - Solution.

Chl Lime - mark light ~~brown~~ yellow soon
fades. whitens paper slightly, mark very
inferior -

Citrate Magnesia - Mark blue inferior

Caustic Pot. mark yellow inferior.

Phosphate Soda. mark blue. which time
intensifys strongly.

[LEFT PAGE IS BLANK]

Caustic Ki & Iodid in Excess — Mark yellow scarcely perceptable,

Aqua Ammonia, Mark drab, inferior very

X Borac Acid, Mark Blue - Good but slightly inferior

Silicic Acid - Mark Blue, inferior - S acid insoluable

Sulphate Potash. Inferior slightly

Carb Soda - light blue mark very inferior

Saltpeter - Blue mark Slightly inferior

Sulphate Copper - Blue mark. Slightly inferior

Sulphate Soda. Blue mark. Very "

Formic Acid. Blue mark Slightly Infr

X Acetate Lead. S. " Inferior, after paper dry it is white

Alum - Inferior

Cyanide Pot. Mark yellow very Inf.

Carb Ammonia, Mark light drab very Inf.

Stearic Acid insoluable — dont effect

Hydrosulphite Soda - marks unchanged

Sulphate Zinc No mark

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Arsenious acid — no change

Sulphuret of Calcium - blue mark very Inf.

Iodide Potassium Blue mark Inferior

Muriate tin - no good without Salt, probably poor Conductor.

Benzoic acid Blue mark. Very Inf.

Galls. " " " "

Acetate Manganese " " "

Ferrocyanide K. " "

Nitro Prusside Sodium " "

Sports Camphor - precipitate, no chge if any slightly Inf.

Chromic acid very inferior

Nitric & Pyrogallic A. no regular ovy inferior with both am & tin pen

Hydrofluoric acid very inf.

Flower Sulph insoluble

Oxalic acid blue mark slightly Inf

Chloric acid " " "

Potassio Sulphocyanx. " "

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Nitrate Cobalt. light blue - very Inf

Silicate Soda. Blackest blue. slightly Inf

Bichromate Pot. Ragged dark blue mark. Slightly Inferior

Ammonia-Citrate Iron - Green mark S. Inf.

Bichl Mercury. " "

Bichromate Pot & Sul A. very strong when leaves pen. fades to light green. Inferior Ferrid added in Excess. "

X Starch added. gives the paper a glossy appearance Whitens it and the Turnbull blue is deposited in a great measure on the starch which gives mark a fine sharp appearance and the Color is somewhat deeper than with the regular Solution.

X Sulphuric Acid added gives a deeper mark than regula owing probably only to reduction in R of paper which would be a little worth an' long-crounts.

Nitrate Silver - Better than Reg. ~~no~~ deeper mark -

Black Ox Manganese light green mark. Inferior

Sulphuric A. & Ferrid alone - very Inf

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Peroxide Iron — good. deeper than reg — mark ragged.

Gallic Acid — Blue mark. Inf slightly

Hydrosulphuric acid — Inferior.

All above test is shown in Chemical Strip in Scrap book
Allison & Mitchell 21 hours.

Test the induction on a clear line of the relay in balance or bridge. Then with a line of same R. Statically arranged. Test the amount and character of the induction from same relay and observe what effect the gradual fall of the main current has upon the induction discharge. Try same with Secondary batteries.

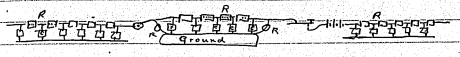
Make four bottles secondary battery, place them in one side of bridge. first fill with 4 pennyweights Muriate Ammonia then 4 do of Sal Soda — Alum — Bich Pot — Iodide P. — Citric A — few drops Chl Sodium — Nitrate Ammonia liquid Am — Glacial Acetic A — Citric A. Sul Cop — Sul Acid — Hydrid — Sul Zinc Black Ox Mang & all the other Chemicals

[illegible]

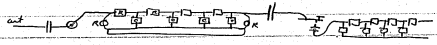
[illegible]

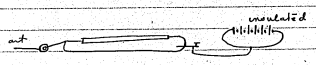
[illegible]

Cable Experiments -



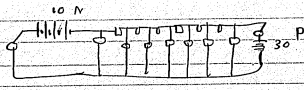
Transmitting a P. Current both through ground and Cable with two static abutments for grounds.





See what speed obtainable on 9000, Ohms R with one cup battery Iodide paper. If no mark try to improve Iodide ppr. till mark obtained

Try this



also test if a Voltaic Battery put in circuit immediately aft the dot has been made sent + the sending End to air will have any effect in stopping the flow from the Condensers. Use same number of Elements to Kill Charge from Condensers as is used to send with. If it does not Kill the Charge or have any Effect then

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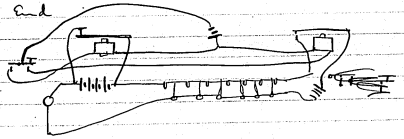
It is perhaps possible to transmit with Voltaic & Static E at the same time and perhaps a Compensation might be devised upon the difference in these two forms. It is also possible that it is better to work at Sending End with Static from an artificial, or to make the mark with Voltaic & Send Reversed with Static or Vice Versa - Try with 20 p at receiving End and 20 n Same direction sending End



Also reverse send with P & N the Batty at Rec End to oppose static when Cut in.

I have noticed that a Morse Relay on a Regular line works much sharper with a battery at both Ends than when the battery is at the Sending End only when the latter is used the N - the stick and the working is light which is not the case when 2 batteries are used. The sticking acts precisely like the Effect of the Static Charge - Of Course when 2 batteries are used in opening the Circuit One battery is Cut off but the battery at receiving End remains on & perhaps Keeps the line

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charged or prevents the static from flowing out. If it however performs some good function test this —

It is possible when we consider that both batteries form the static that it would perhaps be better to have several times the number of cups at the receiving end as at the sending end.

Ascertain if the induction is as great from a magnet with its cores nearly saturated with magnetism as when it is free from magnetism. Use a bridge and a duplex relay the extra coil having a good battery permanently attached to it the bridge connected to the line free of static. Be sure that the magnetism in the cores due from the local is the same as that induced by the main battery.

It is possible that 40 cups kept permanently on the cable at receiving end the signals could be made better by throwing in & out 10 cups at receiving end without breaking circuit than they could by using the whole 50 at sending end.

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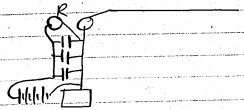
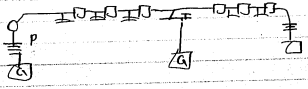
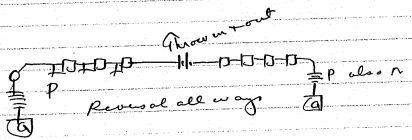
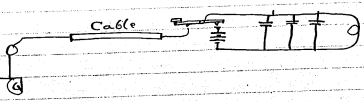
attract the static.



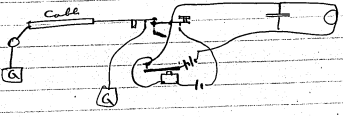




Use the static charge to work the cable



If it is necessary to put regular to ground use the arrangement



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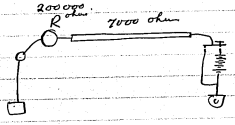
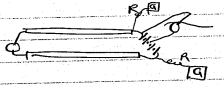
W Siemens claimed etc - that when a current is sent along through a submerged cable - a quantity of Electy is retained in charge along the whole surface to be distributed, proportional to the tension at each point - Rep Joint Com Eng p 381 Therefore

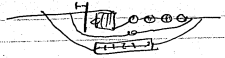


Shellac thickly the iron receiving drum or make a hardrubber one. Use 4 receiving pens for Roman on two wires place 2 pending & 2 Reg pens one letter ahead of the other two

In a two State Circs thus



In the Duplex transmitting two messages in same direction, place the secondaries in to kill self induction Then shunt the shunted Relay (common) with a "Magnetic Compensator" Box hunrd. 5 - Thus



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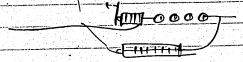
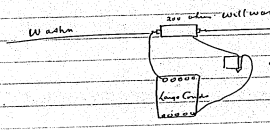
or probably this



Try this Duplex on Stated Line = Equal to Pittsburgh

Try it stated & Rheo with Condenser like the 3100 W plan from Washington



Tried it with accumulators 7 in one of the branches leading from Rheo in line to Condenser tried in both branches but did not make any perceptible change = Tried the Condenser thus

~~got~~ no Current it was probably too short to work relay

~~Tried this~~

Metals precipitated by Reagents. highly diluted. to ascertain what Metal with what Reagent will give a color at the highest dilution —

First Sol. Water 24. Fluidounces
Second — " 12 " 1 fluiddch of Acetate of lead.

1 fluid drachm of No 2
put in No 1.

a little of the solution put in a test tube
Acidated with hydrosulphuric Acid —
(Vague pecup yellow prob due Sulphur due to Water
2 fldchm No 2 in 1
(Vague — Grey Opal Color)

6 fldchm No 2 in 1
(Vague

17 fldchm No 2 in 1
(better. — Standard

Sul Cop
1 fluid dchm

Fluid extract of No 2 in No 1

		No. 24 fluid ounces	No 2 12 fluid ounces			Remarks
Sul Cop	Hydrosul				1	quite same with water vague
Sul Cop	"	"	"		4	vague " "
"	"	"	"		17	little vague yellow
					30	better yellow percep defined Equal to standard lead solution
Mur Iron	"	"	"		1	coarse percep
Tartar Emetic					24	" "
					40	" " further test it
	"	+ Muriate "	"		32	well defined Equal to standard
Bismuth Not tried in Muriate	} no good again trying with Salts of Bismuth					
Iod					16	vague yellow add Muriatic +
Mercy						ammonia darken Equal to standard
					32	quite dark with Ammonia no Muriate darker than standard
						Hydrosulphuret Amm quite black strong
						darker that Lead standard

101

24 fluidounces water first solution — 12 ounces water in second solution grain of article dissolved in second solution — Column 1 gives name of salt. 2 The best Chemical 3 the amount No 2 sol put in No 1 in fluidrachm.

1	2	3	
Sulphate iron	Hydrochloric	8	Vague
"	Hydrosulph Amm	8	Intense black —

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Get Resis. of Iodine paper moved 3 inches per sec. to prevent the I from insulating the pen. See if the resistance does decrease as battery increases.

Make 'Little's' solution
12 Water
4 Sol. Chl. Cal.
2 Sal Sol. Ferrocyanide Pot.
add Chromic ac. till assumes sherry colour
then add 50 part Chl. Sod.

Try in place of Ferrid Pot.
3 oz Ferrocyanide Pot.
1 oz Water
70 Chl Sod
a little Hcl

CAUGHT IN THE ACT.

GERMAN CHARACTER SKETCHES.—[SIR NEIL PAGE.]

Result.

Result

Result: with this solution I get a light blue paper & a dark blue mark with an Iron pen but it does not come out for a short time. No better with cocoa of either.
As this sol. throws a blue precip with sulph of Iron, added some sulph ac but no better results.

Boiled Logwood Solution

Nitrat Ammon	Nickel	dark Sen
1 ~~Lobb~~	Iron	Violet Sen
	Copper	dark Sen
	Plain with 2mo Red	

a dilution of little aqua ~~Ammonia~~ darkens the pap but increases sensitiveness. Pap generally by ordinary Reagents 1 Cell — Nickel 1st Copper 2nd 2mo 3rd in Sensitiveness with Excess aqua ~~Ammonia~~.

2

Log. Sul Soda — Iron Copper Silver Nickel Copper Most sensitive, addition Permanganate Pot. Colors pap deep Nickel & Copper only. Not very sensitive

3

Log. Chl Ammonium — no metal Except Iron gives Color, purple sensitive Paper light yellow to same add Chl Sodium pencil: after whole Nature Iron ~~so~~ gives very light purple Mark while Rooth Metal Except Platina gives a mark that Black & to ~~Coble~~ Dont Come out for first instant, later, due to Iron underneath by willing new slip & ~~Rec~~ Commodity all pens to Zinc get that purple Mark on nearly all pens but it quickly fades Quite sensitive Wont do it on Platina Base but on Iron foil Base.

Log - Sulphate Sodium - Chl Sodium
~~Hydr~~ Nitric Acid Iron pen Yellow paper
- Purple Marks with Iron pen only
first imperceptible but comes out more
sensitive than ferric. 1 Cell through
10000 ohms - ferric

Log - Sul Manganese Copper pen - Mdly
Sensitive,

Soaked all night
6 to 12

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Experiments with the new fuse
Chem Decomp moving a fuse. April 10. 74

Removing a current does not help it a bit with Potassic Hydrate.

Potassic Hydrate in paste rather dry OK –
~~Fuse fuse~~ Zincic Chloride increases friction when hydrogen evolved on lead, very strong but probably not so strong as hydrogen reducing friction with Potassic Hydrate,

Silicic Hydrate acid, increases friction when hydrogen is evolved, probably more noticeable than with Zincic Chl.
Oxygen appears to produce no effect in either,

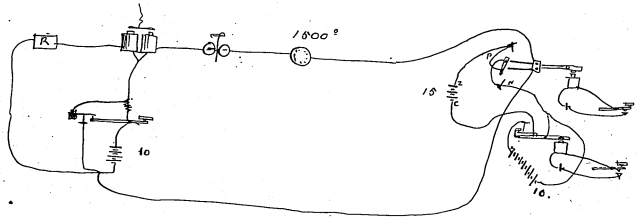
Hydrated Silicic Acid & Potassic Hydrate
Hydrogen decreases friction not so strong as Potassic hydrate Silicic a apparently

Sodic Phosphate, H dec fric, not very good

Ammonic Chloride – very poor if anything increases

Mercuric Sulphate, the hydrate Ammonic Chloride in it increases friction greatly with O decreases a little with H

Mercuric Nitric – not so good acts both ways like Mercuric Sul


R
1500°
10
15
10.

200,000
112,000
560,000
30 87,500,000

Each 4 of us own 25 in 100
~~[illegible]~~ 20 parts of hundred
leaving. Each 20 parts in 100
Recd 12000, for my 5 of 25
meaning 4 more [illegible] would
for double that is 24000 or 5

112,000.

100.

112
5
560,000
1